MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

BOM2064 – QUALITY AND OPERATIONS MANAGEMENT

(All Sections / Groups)

29 MAY 2017
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This Question paper consists of 8 pages with **FOUR** (4) questions only. Relevant equations and normal distribution tables are provided in the Appendix.

2. Answer **ALL** questions. The distribution of the marks for each question is given at the end of each question.

3. Please write all your answers in the answer booklet provided.

QUESTION 1

a) Services represent an increasing share of the economy, which places added importance to understanding and dealing with the challenges of managing services. Explain **FIVE (5)** challenges of managing services.

(10 marks)

b) Mary Anne has a part-time business producing seasonal plywood yard ornaments for resale at local craft fairs and bazaars. She currently works 8 hours per day to produce 16 ornaments.

i) What is her productivity?

(2 marks)

ii) She thinks that by redesigning the ornaments and switching from use of a wood glue to a hot-glue gun she can increase her total production to 20 ornaments per day. What is her new productivity?

(2 marks)

iii) What is her percentage increase in productivity?

(1 mark)

c) Weekly sales of copy paper at JW Copiers are provided in the table below.

Week	Sales (cases)
1	17
2	21
3	27
4	31
5	19
6	17
7	21

i) Compute a three-period moving average and a four-period moving average for weeks 5, 6, and 7.

(3 marks)

ii) Compute the MAD for both forecasting methods.

(4 marks)

iii) Which model is more accurate?

(1 mark)

iv) Forecast week 8 with the more accurate method.

(2 marks)

(Total: 25 marks)

Continued...

QUESTION 2

a) "House of Quality", a product development techniques had long been used in Japan and is gaining popularity in other parts of the world. Discuss the **SEVEN** (7) steps involved in building the House of Quality.

(14 marks)

b) Explain the Pareto phenomenon.

(5 marks)

c) Store ABC has been operating for three years and recently they have received complaints from customers regarding their check-out process. Apply the Pareto principle to solve this problem.

Reason for unsatisfying check-out at Store ABC	**Frequency**
Unfriendly cashier	27
Incorrect change	4
Cashier too slow	9
Price check	34
Poorly bagged merchandise	2
Slow receiving check approval	3

(6 marks)

(Total: 25 marks)

QUESTION 3

a) Cartons of soy milk are supposed to weigh exactly 32 ounce. Inspectors want to develop process control charts. They take ten samples of six boxes each and weigh them. Based on the following data, compute the lower and upper control limits and determine whether the process is in control. (**Note**: Write your answers in nearest **TWO decimals**).

Continued...

Sample	Mean	Range
1	33.8	1.1
2	34.6	0.3
3	34.7	0.4
4	34.1	0.7
5	34.2	0.3
6	34.3	0.4
7	33.9	0.5
8	34.1	0.8
9	34.2	0.4
10	34.4	0.3

(15 marks)

b) Explain the purpose of CPFR and the steps involved in CPFR process.

(10 marks)

(Total: 25 marks)

QUESTION 4

a) CoffeeTea Shop uses 4 kg of a specialty coffee weekly; each kg costs RM 16. Carrying costs are RM 1 per kg per week because space is very scarce. It costs the firm RM 8 to prepare an order. Assume the basic EOQ model with no shortages applies. Assume 52 weeks per year, closed on Mondays.

i) How many kg should CoffeeTea order at a time?

(4 marks)

ii) What is total annual cost (excluding item cost) of managing this item on a cost-minimizing basis?

(4 marks)

iii) In pursuing lowest annual total cost, how many orders should CoffeeTea place annually?

(2 marks)

iv) How many days will there be between orders (assume 312 operating days) if CoffeeTea practices EOQ behaviour?

(2 marks)

Continued...

b) Barzoo Corporation is a manufacturer of children's toys. A manager wants to determine the number of containers to use for incoming parts for a kanban system to be installed next month. The process will have a usage rate of 80 pieces per hour. The manager has assigned an inefficiency factor of 0.35. Each container holds 45 pieces and it takes an average of 75 minutes to complete a cycle. Advise the company on the following:

i) How many containers should be used?

(5 marks)

ii) What is the maximum inventory?

(3 marks)

c) Just-in-time delivery process sparked Toyota engineers to rethink their methods and pioneer a new approach, a kanban system. Explain the kanban system.

(5 marks)

(Total: 25 marks)

Continued...

RELEVANT EQUATIONS

1) CL = $\overline{\overline{X}}$, $\overline{R}$

UCL, LCL (X – bar) = $\overline{\overline{X}} \pm A_2 \overline{R}$

UCL (R) = $D_4 \overline{R}$

LCL (R) = $D_3 \overline{R}$

Table for X – bar & R Charts

No of Observation	A2	D3	D4
In sub group n			
2	1.88	0	3.27
3	1.02	0	2.57
4	0.73	0	2.28
5	0.58	0	2.11
6	0.48	0	2

2) UCL c = $\overline{c} + 3\sqrt{\overline{c}}$

LCL c = $\overline{c} - 3\sqrt{\overline{c}}$

3) $\overline{p}$ = Total No of Defective from All Samples/ (No of Samples X Sample Size)

$Sp = \sqrt{[\overline{p}(1 - \overline{p})/n]}$

CL = $\overline{p}$

LCL = $\overline{p} - 3\,Sp$

UCL = $\overline{p} + 3\,Sp$

4) Capacity Utilization = Capacity Used / Best Operating Level

5) $$r = \frac{n\sum XY - [\sum X \sum Y]}{\sqrt{\left[n\sum X^2 - (\sum X)^2\right]\left[n\sum Y^2 - (\sum Y)^2\right]}}$$

$$a = \overline{Y} - b\overline{X}$$

$$b = \frac{n\sum XY - \sum X \sum Y}{n\sum X^2 - (\sum X)^2}$$

Continued...

6) Exponential smoothing

Forecast for the month t: $F_t = F_{t-1} + \alpha(A_{t-1} - F_{t-1})$

7) Inventory Management:

$$\text{EOQ} = Q^* = \sqrt{\frac{2DS}{H}} \qquad TC = \frac{Q}{2}H + \frac{D}{Q}S$$

$$\text{EPQ} = Q_0 = \sqrt{\frac{2DS}{H}}\sqrt{\frac{p}{p-u}} \qquad I_{\max} = \frac{Q}{P}(p-u) \qquad TC = \frac{I_{max}}{2}\text{H} + \frac{\text{D}}{\text{Q}}\text{S}$$

$$SS = z\,(\sigma\text{d})\sqrt{LT} \qquad ROP = \bar{\text{d}}\,(LT) + z(\sigma\text{d})\sqrt{LT}$$

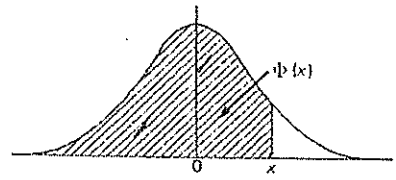
8) Lean Operations:

$$N = \frac{DT(1+X)}{C}$$

Continued...

TABLE 4. THE NORMAL DISTRIBUTION FUNCTION

The function tabulated is $\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{1}{2}t^2}\, dt$. $\Phi(x)$ is the probability that a random variable, normally distributed with zero mean and unit variance, will be less than or equal to x. When $x < 0$ use $\Phi(x) = 1 - \Phi(-x)$, as the normal distribution with zero mean and unit variance is symmetric about zero.



x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
0·00	0·5000	0·40	0·6554	0·80	0·7881	1·20	0·8849	1·60	0·9452	2·00	0·97725
·01	·5040	·41	·6591	·81	·7910	·21	·8869	·61	·9463	·01	·97778
·02	·5080	·42	·6628	·82	·7939	·22	·8888	·62	·9474	·02	·97831
·03	·5120	·43	·6664	·83	·7967	·23	·8907	·63	·9484	·03	·97882
·04	·5160	·44	·6700	·84	·7995	·24	·8925	·64	·9495	·04	·97932
0·05	0·5199	0·45	0·6736	0·85	0·8023	1·25	0·8944	1·65	0·9505	2·05	0·97982
·06	·5239	·46	·6772	·86	·8051	·26	·8962	·66	·9515	·06	·98030
·07	·5279	·47	·6808	·87	·8078	·27	·8980	·67	·9525	·07	·98077
·08	·5319	·48	·6844	·88	·8106	·28	·8997	·68	·9535	·08	·98124
·09	·5359	·49	·6879	·89	·8133	·29	·9015	·69	·9545	·09	·98169
0·10	0·5398	0·50	0·6915	0·90	0·8159	1·30	0·9032	1·70	0·9554	2·10	0·98214
·11	·5438	·51	·6950	·91	·8186	·31	·9049	·71	·9564	·11	·98257
·12	·5478	·52	·6985	·92	·8212	·32	·9066	·72	·9573	·12	·98300
·13	·5517	·53	·7019	·93	·8238	·33	·9082	·73	·9582	·13	·98341
·14	·5557	·54	·7054	·94	·8264	·34	·9099	·74	·9591	·14	·98382
0·15	0·5596	0·55	0·7088	0·95	0·8289	1·35	0·9115	1·75	0·9599	2·15	0·98422
·16	·5636	·56	·7123	·96	·8315	·36	·9131	·76	·9608	·16	·98461
·17	·5675	·57	·7157	·97	·8340	·37	·9147	·77	·9616	·17	·98500
·18	·5714	·58	·7190	·98	·8365	·38	·9162	·78	·9625	·18	·98537
·19	·5753	·59	·7224	·99	·8389	·39	·9177	·79	·9633	·19	·98574
0·20	0·5793	0·60	0·7257	1·00	0·8413	1·40	0·9192	1·80	0·9641	2·20	0·98610
·21	·5832	·61	·7291	·01	·8438	·41	·9207	·81	·9649	·21	·98645
·22	·5871	·62	·7324	·02	·8461	·42	·9222	·82	·9656	·22	·98679
·23	·5910	·63	·7357	·03	·8485	·43	·9236	·83	·9664	·23	·98713
·24	·5948	·64	·7389	·04	·8508	·44	·9251	·84	·9671	·24	·98745
0·25	0·5987	0·65	0·7422	1·05	0·8531	1·45	0·9265	1·85	0·9678	2·25	0·98778
·26	·6026	·66	·7454	·06	·8554	·46	·9279	·86	·9686	·26	·98809
·27	·6064	·67	·7486	·07	·8577	·47	·9292	·87	·9693	·27	·98840
·28	·6103	·68	·7517	·08	·8599	·48	·9306	·88	·9699	·28	·98870
·29	·6141	·69	·7549	·09	·8621	·49	·9319	·89	·9706	·29	·98899
0·30	0·6179	0·70	0·7580	1·10	0·8643	1·50	0·9332	1·90	0·9713	2·30	0·98928
·31	·6217	·71	·7611	·11	·8665	·51	·9345	·91	·9719	·31	·98956
·32	·6255	·72	·7642	·12	·8686	·52	·9357	·92	·9726	·32	·98983
·33	·6293	·73	·7673	·13	·8708	·53	·9370	·93	·9732	·33	·99010
·34	·6331	·74	·7704	·14	·8729	·54	·9382	·94	·9738	·34	·99036
0·35	0·6368	0·75	0·7734	1·15	0·8749	1·55	0·9394	1·95	0·9744	2·35	0·99061
·36	·6406	·76	·7764	·16	·8770	·56	·9406	·96	·9750	·36	·99086
·37	·6443	·77	·7794	·17	·8790	·57	·9418	·97	·9756	·37	·99111
·38	·6480	·78	·7823	·18	·8810	·58	·9429	·98	·9761	·38	·99134
·39	·6517	·79	·7852	·19	·8830	·59	·9441	·99	·9767	·39	·99158
0·40	0·6554	0·80	0·7881	1·20	0·8849	1·60	0·9452	2·00	0·9772	2·40	0·99180

Continued...

TABLE 4. THE NORMAL DISTRIBUTION FUNCTION

x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$	x	$\Phi(x)$
2·40	0·99180	2·55	0·99461	2·70	0·99653	2·85	0·99781	3·00	0·99865	3·15	0·99918
·41	·99202	·56	·99477	·71	·99664	·86	·99788	·01	·99869	·16	·99921
·42	·99224	·57	·99492	·72	·99674	·87	·99795	·02	·99874	·17	·99924
·43	·99245	·58	·99506	·73	·99683	·88	·99801	·03	·99878	·18	·99926
·44	·99266	·59	·99520	·74	·99693	·89	·99807	·04	·99882	·19	·99929
2·45	0·99286	2·60	0·99534	2·75	0·99702	2·90	0·99813	3·05	0·99886	3·20	0·99931
·46	·99305	·61	·99547	·76	·99711	·91	·99819	·06	·99889	·21	·99934
·47	·99324	·62	·99560	·77	·99720	·92	·99825	·07	·99893	·22	·99936
·48	·99343	·63	·99573	·78	·99728	·93	·99831	·08	·99896	·23	·99938
·49	·99361	·64	·99585	·79	·99736	·94	·99836	·09	·99900	·24	·99940
2·50	0·99379	2·65	0·99598	2·80	0·99744	2·95	0·99841	3·10	0·99903	3·25	0·99942
·51	·99396	·66	·99609	·81	·99752	·96	·99846	·11	·99906	·26	·99944
·52	·99413	·67	·99621	·82	·99760	·97	·99851	·12	·99910	·27	·99946
·53	·99430	·68	·99632	·83	·99767	·98	·99856	·13	·99913	·28	·99948
·54	·99446	·69	·99643	·84	·99774	·99	·99861	·14	·99916	·29	·99950
2·55	0·99461	2·70	0·99653	2·85	0·99781	3·00	0·99865	3·15	0·99918	3·30	0·99952

The critical table below gives on the left the range of values of x for which $\Phi(x)$ takes the value on the right, correct to the last figure given; in critical cases, take the upper of the two values of $\Phi(x)$ indicated.

3·075	0·9990	3·263	0·9994	3·731	0·99990	3·916	0·99995
3·105	0·9991	3·320	0·9995	3·759	0·99991	3·976	0·99996
3·138	0·9992	3·389	0·9996	3·791	0·99992	4·055	0·99997
3·174	0·9993	3·480	0·9997	3·826	0·99993	4·173	0·99998
3·215	0·9994	3·615	0·9998	3·867	0·99994	4·417	0·99999
			0·9999		0·99995		1·00000

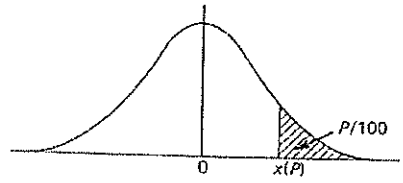
When $x > 3{\cdot}3$ the formula $1-\Phi(x) \doteqdot \frac{e^{-\frac{1}{2}x^2}}{x\sqrt{2\pi}}\left[1-\frac{1}{x^2}+\frac{3}{x^4}-\frac{15}{x^6}+\frac{105}{x^8}\right]$ is very accurate, with relative error less than $945/x^{10}$.

TABLE 5. PERCENTAGE POINTS OF THE NORMAL DISTRIBUTION

This table gives percentage points $x(P)$ defined by the equation

$$\frac{P}{100} = \frac{1}{\sqrt{2\pi}}\int_{x(P)}^{\infty} e^{-\frac{1}{2}t^2}\,dt.$$

If X is a variable, normally distributed with zero mean and unit variance, $P/100$ is the probability that $X \geqslant x(P)$. The lower P per cent points are given by symmetry as $-x(P)$, and the probability that $|X| \geqslant x(P)$ is $2P/100$.



P	$x(P)$	P	$x(P)$	P	$x(P)$	P	$x(P)$	P	$x(P)$	P	$x(P)$
50	0·0000	5·0	1·6449	3·0	1·8808	2·0	2·0537	1·0	2·3263	0·10	3·0902
45	0·1257	4·8	1·6646	2·9	1·8957	1·9	2·0749	0·9	2·3656	0·09	3·1214
40	0·2533	4·6	1·6849	2·8	1·9110	1·8	2·0969	0·8	2·4089	0·08	3·1559
35	0·3853	4·4	1·7060	2·7	1·9268	1·7	2·1201	0·7	2·4573	0·07	3·1947
30	0·5244	4·2	1·7279	2·6	1·9431	1·6	2·1444	0·6	2·5121	0·06	3·2389
25	0·6745	4·0	1·7507	2·5	1·9600	1·5	2·1701	0·5	2·5758	0·05	3·2905
20	0·8416	3·8	1·7744	2·4	1·9774	1·4	2·1973	0·4	2·6521	0·01	3·7190
15	1·0364	3·6	1·7991	2·3	1·9954	1·3	2·2262	0·3	2·7478	0·005	3·8906
10	1·2816	3·4	1·8250	2·2	2·0141	1·2	2·2571	0·2	2·8782	0·001	4·2649
5	1·6449	3·2	1·8522	2·1	2·0335	1·1	2·2904	0·1	3·0902	0·0005	4·4172

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